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Revisiting the age scale of Galactic globular clusters

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Globular clusters (GCs) are among the oldest stellar systems known and serve as time capsules that preserve the early history of galaxy formation and evolution. However, accurately determining GC ages remains challenging due to the intricate dependence of stellar evolution on observable properties. Recent advances—particularly precise astrometric distances from Gaia, chemical abundances from APOGEE , and high-quality photometry from the Hubble Space Telescope—now allow more accurate and systematic age determinations.

GC ages are typically found by fitting isochrones to the positions of stars on the color-magnitude diagram (CMD). We use the SPInS (Stellar Parameters Inferred Systematically) framework to infer stellar ages via Bayesian analysis with Markov Chain Monte Carlo (MCMC). Given the computational cost of applying SPInS to dense cluster CMDs, we develop an automated methodology to identify the main sequence turnoff (MSTO) region and generate a representative population of artificial stars through bootstrapping. This approach reduces computational complexity by targeting a synthetic MSTO population, capturing the age-sensitive features without processing the full population. The methodology is further cross-validated using an independent neural network-based framework (star-age.github.io), ensuring consistency across inference techniques. We aim to derive precise ages for 31 Galactic GCs, with a detailed investigation of the age–metallicity relationship. Preliminary results will be presented.